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Comparison of Three Methods for Determining the Preference Value of Pasture Species by Kermani Sheep in semi-steppe Rangelands in Bid-Khiri Watershed during a Grazing Period

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ABSTRACT

Preference value means selective grazing by livestock, under open grazing system. This study aimed to determine the preference values of pasture species for local livestock (Kermani sheep) by three methods, in semi-steppe rangelands of Bid-Khiri watershed near Bardsir city in Kerman Province from April to September 2013. In this study, three methods were used to determine the Preference value of 12 perennial pasture species and annuals. The methods were: determining of percentage of utilization, calculation of Preference index and direct observation of grazing to measure the percentage of grazing time spent on the species. In the region, annual precipitation is about 270 mm. The data were analyzed seperately, using SAS software in a randomized complete block design and Duncan multiple range test. The results showed a high significance difference between Preference values of the species in all three methods and interaction between Preference values of the species and grazing months. Preference values of the tall grasses obtained from PU method were at a higher level than two other methods during the spring, but in the summer, Preference values of the tall grasses derived from PGT method ranked more higher. Preference values of the tall grasses obtained from the PU method were at a higher level than two other methods during the spring, but in the summer, Preference values of the tall grasses derived from the PGT method ranked at a higher level than the other methods. Preference values of short grasses by the PGT method were at a higher level than other methods during the grazing season. Ranking of non grasses by the PU method indicated that the species had most preference values by this method throughout the season. Ranking of preference values obtained from the IP method were in the middle of the results of the two other methods. In the first method (PU), the result was affected by volume of the plants. By take a mouthful, a grazer consumes greater percentage of the foliage of a small plant than a larger plant. In the second method (PI), the forage consumption by animals is compared to the forage available and so the results seemed to be more realistic. The third method (PGT) had a different procedure and result. The main point is that the length of grazing time is not exactly equal to the amount of grazed forage and the results seemed to be contradictory. But this method is very faster than the other methods.

KEYWORDS: Preference value, Utilization rate, Preference index, Percentage of grazing time, Kermani sheep

INTRODUCTION

Grazing livestock usually consume a diet that differs in terms of plant species, plant parts, and nutrient content from the average of the available plant biomass (Dove, 2010). The herbivores' feeding decisions are at least partly dictated by their will to maximize their energy balance (Optimal Foraging Theory), but as vegetation quality is extremely variable, animals may need to select specific nutrients or avoid toxins (Dumont, 1997). Provenza *at al*. (2003) claimed diets and habitats that allow animals to select among alternatives enable individuals to better meet needs for nutrients and to better cope with toxins. They belived all plants contain toxins, and the amount of toxin an animal can ingest depends on the kinds and amounts of nutrients and toxins in the forages on offer, so nutrients and toxins both cause animals to satiate, and excesses of nutrients, nutrient imbalances, and toxins all limit food intake.

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Preference value means the selection of a specific species as compared to other ones by the livestock which can be defined as a behavioral reaction (Ashouri Sanjabi et al., 2013). Knowledge of what and how much herbage animals eat is needed for proper management of both the animals and the range (Laycock, Buchanan, & Krueger, 1972). In an ecological sense, it would be useful to have an estimate of the intake of forage components (plant species or plant parts) to find which components of the plant biomass are under the greatest grazing pressure (Dove, 2010). Preferences can be calculated in two ways: i) as the proportion of the total intake derived from each range type; or ii) as the proportion of grazing time spent feeding on each patch (Dumont, 1997). Laycock *et al*., (1972) compare three sampling methods esophageal fistula; paired (caged and open) plot; and ocular utilization estimates for determining botanical composition of the diet of sheep and the percentage of each plant species utilized on tall-forb range. They concluded The esophageal fistula method is the most accurate method tested for determining the actual composition (either botanical or chemical) of the diet of sheep; however, it is extremely time consuming, both in the field and in the laboratory. For this reason, it is basically a research tool and not a technique suitable for actual range management operations. The fistula method does not accurately measure the total impact of grazing on the range and Utilization percentages of individual species are also inaccurate because of the number of steps and associated sampling errors involved in the calculation. Krueger (1972) used four relative preference indices to rank preference values for twelve plant species by sheep in a tall-forb community of a summer range in southwestern Montana. Foraging animals may also be observed directly or measured with mechanical or electronic devices (Hart and Hoveland, 1989). The earliest information on time spent foraging was obtained through visual observation over a period of days (Gary *et al*., 1970). Vibracorders, devices developed to monitor the operating times of logging trucks, may have been the first commercially available device adapted to free-ranging livestock providing a time stamped signature of the temporal aspects of foraging (Allden, 1962; Stobbs, 1970). Transmission of data, including electrocardiogram (ECG), electroencephalogram (EEG), and respiratory signals from unrestrained animals is now possible (Lowe *et al*., 2007). The use of video applications in wildlife research has been well documented as a useful technique (Pulliainen 1971; Stewart *et al*.1997) and video surveillance equipment has been used increasingly in studies (McQuillen and Brewer 2000; Roberts and Anderson 2002; Shivik and Gruver 2002). Time-lapse video is widely used by developmental biologists (Robert, 2006). The advantages of a video surveillance system include gaining a permanent record of events that can be replayed as many times as necessary to retrieve data, reduction in observer bias and missed observations, easy habituation by the study animal and the ability to document events that are not easily detected using direct observations (Robert, 2006). Researcher members at Research Institute of Forests and Rangelands (rifr) used three methods in a great project titeld “Determination of attainable forage of rangelands” at 54 sites across the country from 2006 to 2010 to determine preference values of most important rangespecies. The methods were: to compute the percentage of utilization, Preference index and direct observation of grazing by video recording. Zare et al. (2012) studied preference value comparison in range species Anjedan-Arak, Iran and a video surveillance system was used to calculate the time spent on livestock grazing and presence during grazing season for 3 years. Ashouri Sanjabi et al. (2013) studied preference values of forage species and grazing behavior of Tali goat in Chabahar rangelands of Iran. They used a video method to determine the prefrence value of forage species by Tali goat in Chabahar rangelands. Information on food habits of endemic sheeps in Iran is generally scarce, so in this study, we aimed to determine the preference values of the pasture species by local livestock (Kermani sheep) in semi-steppe rangelands in Bid-Khiri watershed and select a suitable methd for determining the preference value according to the analysis of the results.

MATHERIAL AND METHODS

Study area

The study area is located in the semi-steppe rangelands in Bid-Khiri watershed in west of Bardsir city in Kerman Province, Iran, with the coordinates as: (29° 50' to 29° 52’N and 56° 04' to 56° 07’E) and 2560m altitude. The mean annual precipitation is 270 mm.

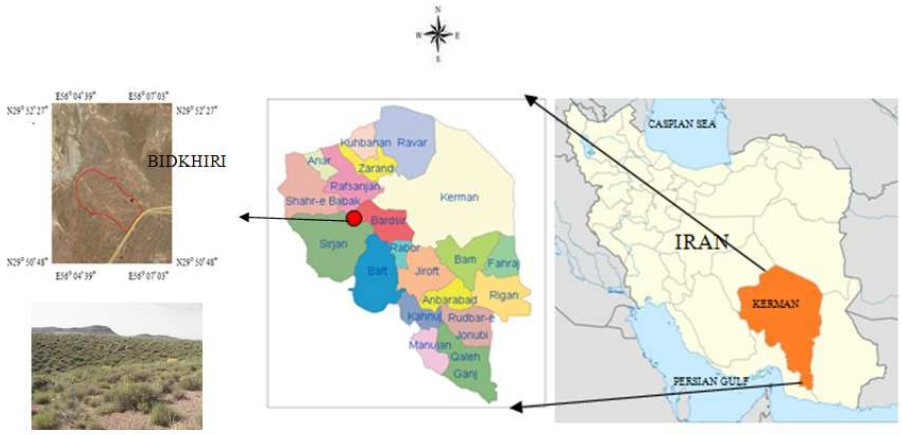

Fig.1. the location of Bid-Khiri rangelands in the west of Bardsir- Iran

Kermani sheep

Kermani sheep is a fat-tail breed in eastern Iran which has a dry and hot climate. Coat color is white with pigmented head and legs. The wool is coarse. The sheep population is managed under a migratory system, utilizing the ranges as the major source of feed (Bahreini Behzadi, 2007). Rams are horned and ewes are horn less. The back was often flat, nasal was flat to a few curve and also eye socket was flat to a few swollen. Average weight in ewes and rams was 42 and 53 kg respectively, height of the withers 63.95, height of the pelvis 62.85, chest depth 28.9, heart girth 84.66, length from withers to pelvis 45.52, height of back 63.9, length of head 20.71, length of was 14.75, length of fat 25.53 and width of fat was 27.15 centimeter (shakri, 2005).

Vegetation

The vegetation of Bid-Khiri rangelands is shrubby and dominant species are *Artemisia aucheri, Agropyron desertorum*, *Astragalus cephalanthus, Astragalus ovoideus, Cicer kermanense, Gundelia tornifortii, Oryzopsis holciformis, poa bulbosa, poa sinaica, prangos ferulaceae*, *Scariola orientalis, Stipa arabica*) and annaul grasses (*Boissiera squarrosa, Bromus danthonia, Bromus tectorum* & *Eremopyrum bonaepartis*). Other species are *Amygdalus elaeagnifolia, Astragalus ajubensis, Astragalus myriacanthus, Cardaia draba, Carex stenosiphylla, Echinops longipenicillatus, Eremopyrum bonaepartis, Eremorus persicus, Erodium sp., Eryngium noeanum, Euphorbia densa,*

Euphorbia szovitsii, Fumaria vaillantii, Geranium tubersum, Hedysarum wrightianum

Hertia intermedia, Hyoscyamus leucanthera, Isatis cappadocica, Ixilirion tataricum

Launaea acanthodes, Linaria lineolata, Melica persica, Nepeta glomerolosa, Noaea mucronata, Paparer dubium, Polygonum dumosa, Psathyrostachys fragilis, Reseda alba, Scorzonera mucida, Scorzonera tortusissime, Taeniatherum crinitus, Trigonella latialata, Tulipa biflora and *Turgenia latifolia.*

METHODS

In this study, three methods were used for determining of Preference value of 12 perenial pasture species (*Agropyron desertorum*, *Artemisia aucheri, Astragalus cephalanthus, Astragalus ovoideus, Cicer kermanense, Gundelia tornifortii, Oryzopsis holciformis, poa bulbosa, poa sinaica, prangos ferulaceae*, *Scariola orientalis, stipa \arabica*) and annaul grasses (*Boissiera squarrosa, Bromus danthonia, Bromus tectorum* & *Eremopyrum bonaepartis*). The methods were determining of percentage of utilization, calculation of Preference index and direct observation of grazing by video recording. In early of the grazing season a one-hectare enclosure was established in the pasture. For each

species, 5 similar stands inside and 5 stands outside of fence were selected and marked at the beginning of the grazing season. For each month of the grazing season, after the entry of livestock to rangeland, the first five stands of the inside and outside of the fence for the first month were harvested. The forage of each stand was separately weighed and recorded. The procedure was repeated for the grazing months. Inside production is subtracted from outside fence production to calculate the cumulative consumption and non-cumulative consumption rate is computed with the subtraction of each month's consumption from the month before consumption. The cumulative consumption divided by cumulative production multiplied by 100, means percentage of utilization. Data were estimated based on non-cumulative production and consumption to calculate the preference index Then, species ratio in forage is equal to the non-cumulative production of each species in the month divided by total production forage in the month multiplied by 100 and the diet ratio is equal to non-cumulative consumption of each species in the month divided by total consumed forage in the month multiplied by 100. Then, species preference value was calculated based on the preference index according to the following equation (Becker, K. and J. Lohrmann, 1992; Van Dyne and Heady, 1965):

$$PI = \frac{\text{species rate in ration}}{\text{species rate in forage}}$$

In the middle of each month, in an early morning, one hour after the arrival of livestock in the pasture, three 20-minute films of a 3-year-old sheep grazing on the species was recorded by a handycam. The films were reviewed in a personal computer and length of grazing time of any species was measured. Length of grazing time of any species devided by lenth of grazing time of all species multiplied by 100 was percentage of grazing time on each species. Finally, the data of percentage of utilization (utilization rate), preference index and percentage of grazing time were analyzed separately, by the SAS software using factorial test in a randomized complete block design and the means were compared using a Duncan Multiple Range Test at $P<0.01$. The means were ranked as the

RESULTS

The results of this study showed that there was a significant difference between the species, and between interactions of species × months in all the three methods. But there was not a significant difference between months, in "percentage of grazing time method". Sepices were *Agropyron desertorum*, *Artemisia aucheri, Astragalus cephalanthus, Astragalus ovoideus, Cicer kermanensis, Gundelia tornifortii, Oryzopsis holciformis, poa bulbosa, poa sinaica, prangos ferulaceae*, *Scariola orientalis, stipa arabica* and *annauls*.

Percentage of utilization (PU)

The results showed that percentage of utilization of the sepices varied during the grazing season. *Poa bulbosa* with %84.2 in September, indicated the highest percentage of utilization, and *prangos ferulaceae* with %3.8 in May, the lowest percentage of utilization among the pasture species. In this case, the tall Perennial grasses (*Agropyron desertorum, Oryzopsis holciformis, and stipa arabica*) showed a severe decrease in PU, but short grasses (*poa bulbosa*, *poa sinaica* and *Annauls*) did not indicate the same trend during the grazing period. *Artemisia aucheri and Scariola orientalis* showed a slight increase, whereas, *Astragalus ovoideus* indicated a slight decrease at the same time. The forage parts of *Astragalus cephalanthus* that were mainly its floral organs were shed by wind from the middle of June therefore; there was no way to compare the individuals between enclosed and grazing regions after that to calculate the PU. *Cicer kermanensis* also revealed a severe decrese in PU. *Gundelia tornifortii* and *prangos ferulaceae,* both had a short life period and were broken and carried away by wind after dry stage (dead stage). *Gundelia tornifortii* indicated a decrease but *prangos ferulaceae* showed an increase in the percentage of utilization during the time (Table 1). On average, short grasses had the most preference value during the period (Fig. 1).

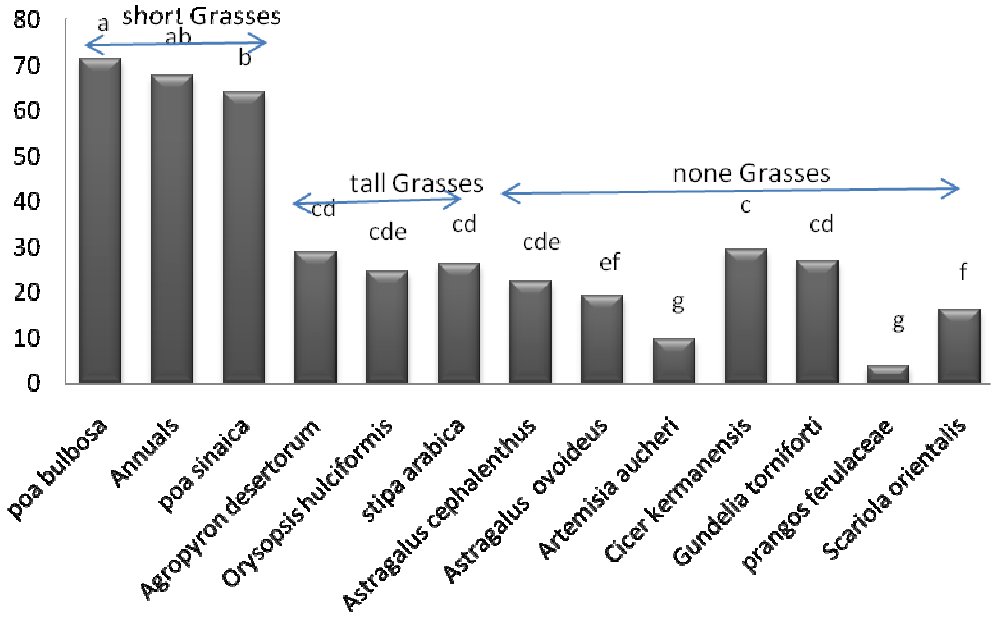

Fig. 1. percentage of utilization of the pasture species

Table 1. interaction between species and months of percentage of utilization - from May to Sptember 2013

	Species	May	June	July	August	September
Tall grasses	*Agropyron desertorum*	57.80±7.59 cf	38.80±5.19 g-i	25.20±3.99 i-l	12.20±2.38 k-n	9.40±1.43 l-o
	Oryzopsis holciformis	47.40±6.03 e-g	26.80±3.19 i-k	22.40±4.46 j-m	15.20±1.46 j-n	11.20±3.38 k-o
	stipa arabica	57.00±5.06 c-f	27.80±3.81 i-k	13.20±1.78 k-n	16.60±4.36 j-n	16.60±3.44 j-n
Short grasses	*poa bulbosa*	75.80±5.95 ab	56.20±4.38 c-f	65.40±6.34 b-d	74.40±4.67 ab	84.20±6.13 a
	poa sinaica	60.80±2.32 b-e	57.80±4.66 c-f	61.40±10.1 b-e	55.20±3.80 c-f	63.40±4.65 b-d
	Annual grasses	65.60±3.96 a-c	63.60±2.68 b-d	64.40±4.50 b-d	73.60±6.87 a-c	80.60±5.21 a
Non-grasses	*Astragalus ovoideus*	22.80±2.87 j-m	17.20±2.68 j-n	16.80±0.96 j-m	13.40±2.02 k-n	12.40±3.91 k-o
	Astragalus cephalenthus	57.40±4.40 c-f	54.00±1.66 d-f	-	-	-
	Cicer kermanensis	53.20±2.74 d-f	42.00±2.05 e-g	30.00±4.21 h-j	14.40±1.16 j-n	6.60±1.68 m-o
	Gundelia tornifortii	62.60±3.50 b-d	43.00±5.45 f-h	27.60±7.68 i-k	-	-
	prangos ferulaceae	3.80±0.95 no	15.20±2.73 j-n	-	-	-
	Scariola orientalis	17.00±1.23 g-i	18.60±3.57 j-n	19.40±3.09 j-m	23.20±3.97 k-o	27.60±6.86 j-m
	Artemisia aucheri	5.80±1.55 m-o	7.20±1.60 m-o	4.20±1.11 no	11.20±1.51 k-o	16.40±1.79 j-m

Similar letters indicate no significant difference

Preference index (PI)

The results of this study indicated that the preference indices varied during the grazing period. The maximum Preference index, referred to *Poa bulbosa* with 3.76 in September and the lowest PI referred to *prangos ferulaceae* with 0.21 in April. *A decrease* of IP *was observed in* Tall grasses during the period whereas an increase of IP was seen in short grasses at the same time. *Artemisia aucheri, Scariola orientalis and prangos ferulaceae* showed a slight increase but *Astragalus ovoideus, Astragalus cephalenthus, Cicer kermanensis* and *Gundelia tornifortii* showed a decrease in IP (table. 2). On average, short grasses had the most preference value, during the period (Fig. 2).

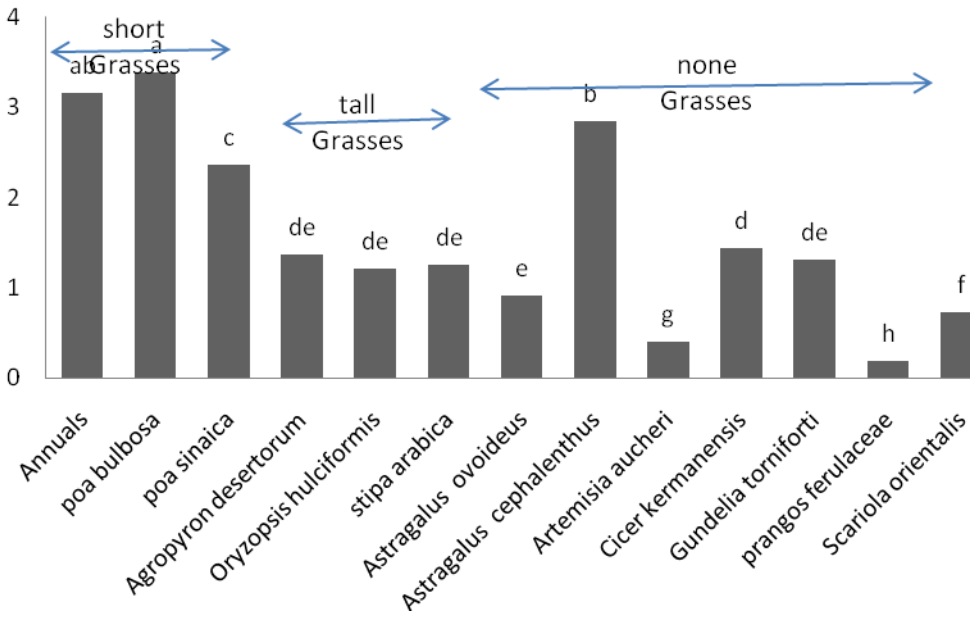

Fig. 2. Preference indicies (PI) of the pasture species

Table 2. interaction between species and months of preference indices - from May to September 2013

	Species	May	June	July	August	September
Tall grasses	*Agropyron desertorum*	2.69±0.97 c-h	1.85±0.38 i-k	1.35±0.18 j-n	0.54±0.03 n-s	0.40±0.02 p-s
	Oryzopsis holciformis	2.42±0.42 e-j	1.27±0.17 j-p	1.16±077 k-q	0.75±0.07 l-s	0.42±0.04 o-s
	stipa arabica	2.85±0.19 b-h	1.29±0.34 j-o	0.70±0.12 m-s	0.83±0.03 l-s	0.63±0.19 m-s
Short grasses	*poa bulbosa*	3.16±0.24 a-g	3.17±0.26 a-g	3.35±0.32 ab	3.54±0.64 ab	3.76±0.58 a
	poa sinaica	2.16±0.46 g-i	2.19±0.31 g-i	2.22±0.85 h-j	2.53±0.19 d-h	2.75±0.65 c-g
	Annual grasses	2.47±0.92 d-f	3.15±0.18 a-g	3.24±0.26 a-e	3.32±0.33 a-b	3.39±0.63 a-b
Non-grasses	*Astragalus ovoideus*	1.25±0.15 j-p	1.06±0.27 k-q	0.95±0.03 l-r	0.75±0.01 l-s	0.55±0.04 n-s
	Astragalus cephalenthus	2.84±0.49 b-h	2.61±0.14 c-g	-	-	-
	Cicer kermanensis	2.63±0.27 e-i	2.02±0.35 h-j	1.57±0.47 j-l	0.74±0.03 l-s	0.25±0.03 rs
	Gundelia tornifortii	2.29±0.49 g-i	2.23±0.41 h-j	1.46± 0.02 j-m	-	-
	prangos ferulaceae	0.21±0.02 rs	0.73±0.14 l-r	-	-	-
	Scariola orientalis	0.61±0.03 m-s	0.77±0.16 l-r	1.06±0.17 k-r	0.64±0.03 m-s	0.58±0.17 n-s
	Artemisia aucheri	0.26±0.01 rs	0.32±0.02 q-s	0.32±0.06 q-s	0.48±0.05 o-s	0.62±0.12 m-s

Similar letters indicate no significant difference

Direct observation to estimate the Percentage of grazing time (PGT)

The result showed that the selected sheep spent most of the grazing time, to graze annual grasses, during the period. In contrary to the previous methods, the interaction between species and months was not significant. The maximum time was spent on grazing annauls with %59 of grazing time by the sheep in sptember. An increase was seen on the time of grazing annuals during the grazing period (Table. 3). On average, the annuals with %46.72 and *Astragalus ovoideus* with %22.76 of grazing time had the most preference value in this method (Fig. 3).

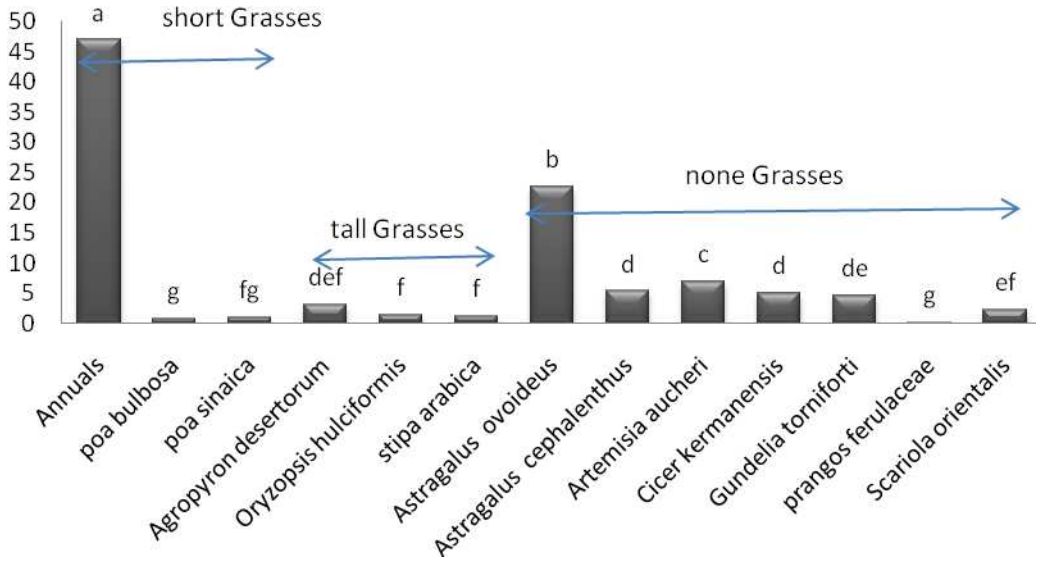

Fig. 3. **Percentage of grazing time on** the pasture species

Table 3. percentage of grazing time spent on the pasture species - from May to Sptember 2013

	Species	May	June	July	August	September
Tall grasses	*Agropyron desertorum*	7.6±0.24 ^{l}	6± 1.00 ^{m}	1±0.00 ^{r}	1±0.00 ^{r}	0± 0.00 ^{s}
	Oryzopsis holciformis	4.3 ±0.58 ^{o}	3± 0.02 ^{p}	0 ± 0.00 ^{s}	0 ± 0.00 ^{s}	0±0.00 ^{s}
	stipa arabica	4.3 ±0.53 ^{o}	2± 0.00 ^{q}	0 ± 0.00 ^{s}	0 ± 0.00 ^{s}	0±0.00 ^{s}
Short grasses	*poa bulbosa*	1± 0.00 ^{r}	3±0.00 ^{p}	0± 0.00 ^{s}	0± 0.00 ^{s}	0± 0.00 ^{s}
	poa sinaica	1±0.01 ^{r}	2.6± 0.00 ^{pq}	0.6 ± 0.00 ^{rs}	0.6 ± 0.00 ^{rs}	0±0.00 ^{s}
	Annual grasses	29.3± 2.28 ^{e}	38± 2.21 ^{d}	55.3± 2.35 ^{b}	54±2.61 ^{c}	57 ±3.42 ^{a}
Non-grasses	*Astragalus ovoideus*	14.9±0.63 ^{j}	20.4± 1.23 ^{h}	26.5± 2.14 ^{f}	27± 1.32 ^{f}	27.4 ± 1.64 ^{f}
	Astragalus cephalenthus	16.6±0.95 ^{j}	5± 0.00 ^{no}	0± 0.00^{s}	0± 0.00 ^{s}	0 ± 0.00 ^{s}
	Cicer kermanensis	8 ±0.1 ^{l}	6± 0.03 ^{o}	5± 0.07 ^{no}	5.4±0.85 ^{mn}	3± 0.00 ^{p}
	Gundelia tornifortii	8± 0.4 ^{l}	10±1.21 ^{k}	2 ± 0.00 ^{q}	2 ± 0.00 ^{q}	5 ±0.03 ^{no}
	prangos ferulaceae	0 ±0.00 ^{s}	1± 0.00 ^{r}	0 ±0.00 ^{s}	0± 0.00 ^{s}	0 ± 0.00 ^{s}
	Scariola orientalis	0 ±0.00 ^{s}	3± 0.08 ^{p}	2± 0.03 ^{q}	2±0.01 ^{q}	4.5 ±0.18 ^{o}
	Artemisia aucheri	2±0.06 ^{q}	3± 0.00 ^{p}	4±0.54 ^{l}	4.7±1.00 ^{l}	5.3 ± 0.56 ^{p}

Similar letters indicate no significant difference

DISCUSSION

Results of the three methods showed that each of the 12 species and the annuals were preferred differently during the period. Preference values of the tall grasses derived from the PGT method ranked at a higher level than the other methods. Preference values of short grasses by the PGT method were at a higher level than other methods during the grazing season. Ranking of non grasses by the PU method indicated that the species had most preference values by this method throughout the season. Ranking of preference values obtained from the IP method were in the middle of the results of the two other methods. In the first method (PU), the result was affected by volume of the plants. By take a mouthful, a grazer consumes greater percentage of the foliage of a small plant than a larger plant. In the second method (PI), the forage consumption by animals is compared to the forage available and so the results seemed to be more realistic. The two aforementioned methods required some protected individuals, Great efforts to measure density, production and consumption, percentage of utilization and preference

index of the species. The third method (PGT) had a different procedure and result. The proportion of time spent in taking mouthfuls of herbage and in associated activities of searching for proper specie and manipulating it in the mouth is extremely variable, which can lead to major difficulties in the estimation of grazing duration and biting rate. However, the automatic systems make it necessary to recognize the phases of ingestion and rumination. The measurements so obtained can therefore be different from the visual observations since only the mastication time in taken into account. This method needs an experienced person, some equipment like a good camera and a computer, adaptation with the herd, in order to avoid of making panic among the herd animals, when you are taking the film. The main point is that the length of grazing time is not exactly equal to the amount of grazed forage and the results seemed to be contradictory. But this method is very faster than the other methods. Dumont (1997) stated that preference value can be calculated in two ways: i) vegetation-based methods as the proportion of the total intake derived from each range type; or ii) animal-based methods as the proportion of grazing time spent feeding on each patch. Vegetation-based methods involve estimating intake from the difference between the herbage mass present on the ground before input and after output from the animals. Previous studies according vegetation-based methods showed that different methods and indices for evaluating animal forage preference values lead to different results. Krueger (1972) used four relative preference indices to rank preference values for twelve plant species by sheep and ranking of preference values for the plant species was different by all four indices. In general short grasses especially annual grasses were the number-one ranked species almost by the all three methods throughout the grazing season. Some previous experimental results on relative preferences or preference rankings reveal that Sheep spend around 70% of their grazing time on white clover when offered adjacent grass and clover strips (Rutter, 2006). The difference may be because of lack of white clover and low density of other proper legume species in Bid-Khiri rangland, Rook et al., (2002) indicated the relative availability of clover also affects the proportion of clover in the diet and Preference for clover may also vary with season. Newman et al (1994) stated Sheep that have been fasted show a lower preference for clover than those that have not. Penning et al., (1991) believed sheep often eat clover more quickly than grass; consequently, grazing time alone is likely to under-estimate the daily intake of clover and over-estimate the intake of grass, and so under-estimate preference for clover. Penning at al., (1991) stated that sheep show a consistent diurnal pattern of preference, with a strong preference for legume in the morning, but the proportion of grass in the diet increases over the course of the day. Other species except the fragrant species, showed a steadily decrease in their preference values during the season. It may be referred to their coarseness after changing from green to dry and their palatability.

Bohning (1999) noted that the palatability of most grasses and forbs decreased as the plant changed from green to dry. As the pasture dries out, the level of nutrients in it drops. What remains are the less digestible complex carbohydrates (cellulose, hemicellulose and pectins) and waste products from metabolism and photosynthesis. Laycock, at al., (1972) used three methods of determining diet, utilization, and trampling damage on sheep ranges. Results of all methods showed a stable or slightly increased dry weight intake from early to late summer. The results in Tables 1, 2 and 3 showed the fragrant species (*Artemisia aucheri* & *prangos ferulaceae*) were nearly rejected because of their unpleasant essences, but in the late developmental stages were more favoured rather than other stages. Keshavarzian noted that *Artemisia aucheri* contains large amounts essence of terpenoids group, particularly sesquiterpene lactones, ketones and monoterpene (Keshavarzian 2014). Green *Prangos ferulacea* is not consumed by cattle because of its unpleasant essences; rather, it is cut and dried to be used as fodder in winter (Hasani and shahmoradi, 2007). Other Studies have indicated that different cattle (cows, sheep and goats) do not graze *prangos. ferulacea* in any growth stage (Ebrahimi *et al*., 2007, Farid, 1991).The existence of coumarines in large quantities in green limbs of *P. ferulacea* (Ahmed *et al*., 2011) and its unpleasant odor probably prevents *P. ferulacea* from being grazed in different growth stages

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